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Hermatypic Coral Fauna of Subtropical Southeast Africa: A Checklist[1]

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ABSTRACT: The South African hermatypic coral fauna consists of 96 species in 42 scleractinian genera, one stoloniferous octocoral genus (*Tubipora*), and one hermatypic hydrocoral genus (*Millepora*). There are more species in southern Mozambique, with 151 species in 49 scleractinian genera, one stoloniferous octocoral (*Tubipora musica* L.), and one hydrocoral (*Millepora exaesa* [Forskål]). The eastern African coral faunas of Somalia, Kenya, Tanzania, Mozambique, and South Africa are compared and Southeast Africa distinguished as a biogeographic subregion, with six endemic species. Patterns of attenuation and species composition are described and compared with those on the eastern boundaries of the Indo-Pacific in the Pacific Ocean.

KNOWLEDGE OF CORAL BIODIVERSITY in the Indo-Pacific has increased greatly during the past decade (Sheppard 1987, Rosen 1988, Sheppard and Sheppard 1991, Wallace and Pandolfi 1991, 1993, Veron 1993), but gaps in the record remain. In particular, tropical and subtropical subsaharan Africa, with a rich and diverse coral fauna (Hamilton and Brakel 1984, Sheppard 1987, Lemmens 1993, Carbone et al. 1994) is inadequately documented, especially southern Africa (Boshoff 1981, Ramsey and Mason 1990). High-latitude reefs in Japan (Veron 1992), the northern Red Sea (Sheppard and Sheppard 1991), and Australia (Veron 1974, Veron and Done 1979, Veron and Marsh 1988) have been shown to be surprisingly rich in coral species, but currently there are only preliminary (Wijsman-Best et al. 1980, Ramsey and Mason 1990) or taxonomically inaccurate (Boshoff 1981) lists of the corals of the high-latitude reefs of Southeast Africa.

In this paper, a checklist of the hermatypic coral fauna of subtropical Southeast Africa, which includes the southernmost corals of Maputaland and northern Natal Province, is evaluated and compared with a checklist of the coral faunas of southern Mozambique (Boshoff 1981). Faunal composition and patterns of distribution of the southern African corals are compared with those of corals of the Pacific Ocean.

MATERIALS AND METHODS

The hermatypic coral collections in the South African Museum in Cape Town, the Oceanographic Research Institute in Durban, and the Zoological Museum of Tel Aviv University, Israel, were consulted and revised. New material, collected to complement existing collections and now deposited in the above institutions, was obtained from three reef complexes of Maputaland, northern Natal (Figure 1); on Aliwal Shoal, central Natal; and from several intertidal locations along the Natal shoreline (Island Rock, Jesser Point, St. Lucia, Chaka's Rock, Umdloti, Durban, Pennington, Port Shepstone). The corals in the collection on which Boshoff (1981) based his list were examined, but it

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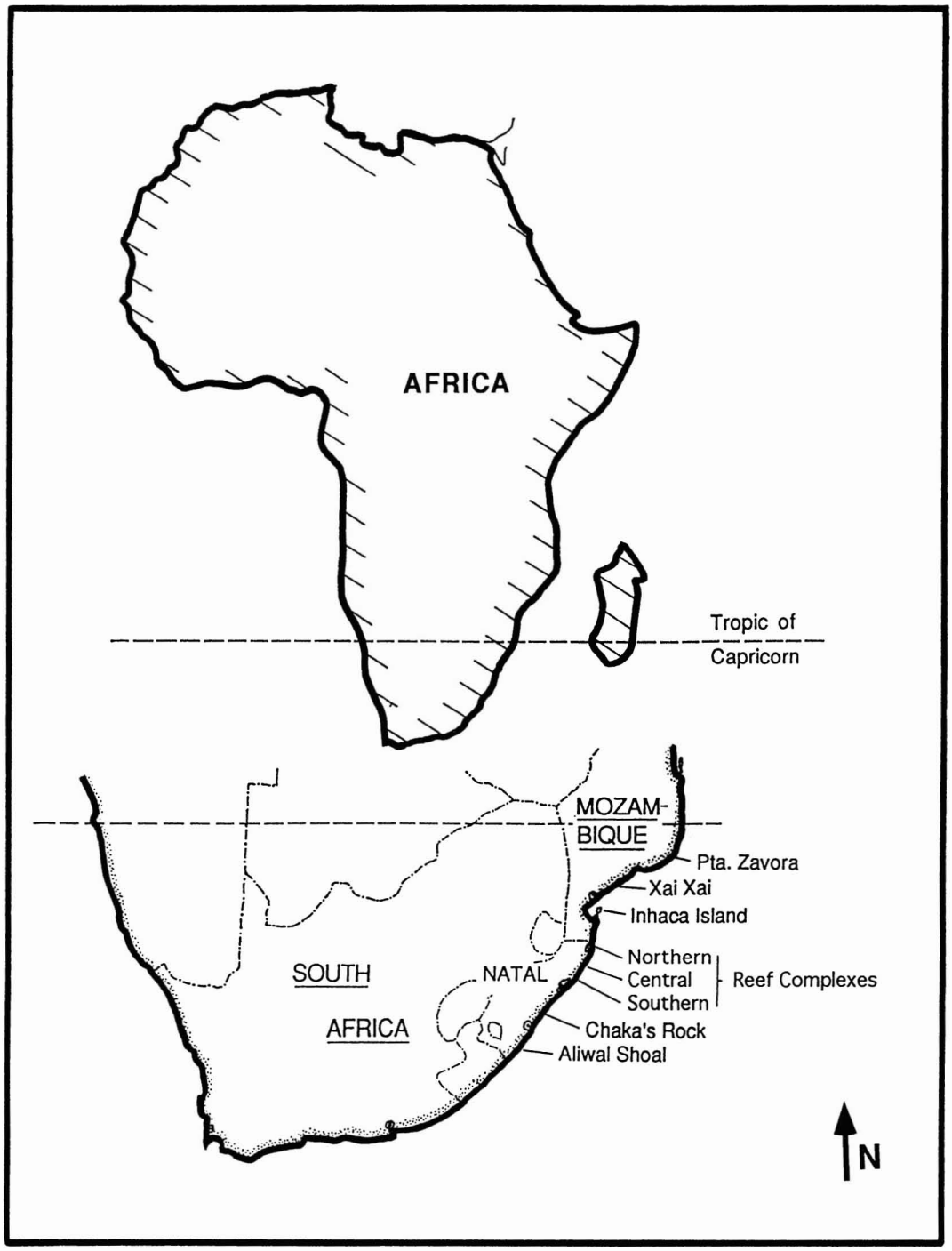

FIGURE 1. Overview of the sampling areas in Southeast Africa.

was not possible to locate the corals collected by Crossland (1948) in either the Natal Museum in Pietermaritzburg or the South African Museum in Cape Town.

Data sets of eastern African coral faunas from Somalia to South Africa and Madagascar were obtained from the literature and compared by means of agglomerative, hierarchical cluster analysis using Ward's method of linkage and the binary Lance-Williams dissimilarity index (Digby and Kempton 1987).

RESULTS

Ninety-four species of corals are recorded here from South Africa and 126 from southern Mozambique. The checklist (Table 1) is based on biogeographic and taxonomic research by Riegl (1993, 1995*a,b*, 1996).

If all records from previous checklists of these areas are included, 96 species are known from South Africa (Wijsman-Best et al. [1980] included *Favites chinensis* [Verrill] and Veron [1993] included *Psammocora profundacella* Gardiner), and 151 species are known from Mozambique (Wijsman-Best et al. [1980] included *Psammocora contigua* Esper, *Acropora decipiens* [Brook] = *robusta* [Dana], *A. polymorpha* [Brook], *Astreopora listeri* Bernard, *Montipora foliosa* [Pallas], *M. spumosa* [Lamarck], *Pavona explanulata* [Lamarck], *P. divaricata* Lamarck, *P. varians* Verrill, *P. praetorta* Dana, *Leptoseris mycetoseroides* Wells, *Favites chinensis*, *Goniastrea australiensis* [Edwards & Haime], and *Platygyra lamellina* [Ehrenberg]; Sheppard [1987] included *M. flabellata* Studer, *M. foveolata* Bernard, *M. hispida* [Dana], *M. paupera* Marenzeller, and *Alveopora daedalea* [Forskål]; and Veron (1993) included *Montipora effusa* Dana, *M. friabilis* Bernard, *Leptoseris incrustans* [Quelch], *Diaseris fragilis* Alcock, *Psammocora explanulata* van der Horst, and *Turbinaria irregularis* Bernard). The Mozambican fauna includes the second highest number of coral species recorded so far in eastern Africa (Lemmens [1993] recorded 169 species in East Africa).

In the checklist presented here, the name *Acropora clathrata* (Brook, 1891) is used for a common tabular species that forms fully fused plates (Riegl 1995*b*). It corresponds to the original description of *Acropora vasiformis* (Brook, 1891), which is considered by Veron and Wallace (1984) a synonym of *A. clathrata*. It is possible that some specimens belong to the similar species *Acropora solitaryensis* Veron & Wallace, 1984, which is not listed.

Table 2, which summarizes the changes in records cited above, indicates the inadequacies of the previously documented coral fauna of southeastern Africa. The Boshoff (1981) records are especially misleading: 70% of the list consists of erroneous records, some of which are listed in Sheppard (1987) and Veron (1993).

The coral faunas of South Africa and Mozambique are compared with those of Somalia (63 species [Carbone et al. 1994]), tropical East Africa (169 species, Tanzania and Kenya [Hamilton and Brakel 1984, Sheppard 1987, Lemmens 1993]), and Madagascar (113 species, Tulear region, SE Madagascar [Pichon 1978, Sheppard 1987]) in Figure 2. The southeastern African coral fauna forms a distinct subunit determined largely by a group of endemic species (*Acropora branchi* Riegl, *A. mossambica* Riegl, *A. natalensis* Riegl, *A. sordiensis* Riegl, *Acanthastrea simplex* [Crossland], and *Goniopora crassa* Crossland). The faunas of tropical East Arica and Madagascar are also similar, although they resemble each other less than they do the southeastern African faunas. The poorest fauna, that of Somalia, with only 63 species, more closely resembles the East African fauna than that of South Africa.

DISCUSSION

The checklist is necessarily incomplete, and the list may eventually be increased by as much as 10%; further sampling doubtless will provide records of rare and other overlooked species, and several corals, particularly species of *Montipora*, remain to be identified.

Different patterns of faunal attenuation

TABLE 1

CHECKLIST OF CORAL SPECIES RECORDED FROM SOUTH AFRICA AND MOZAMBIQUE FROM RIEGL (1993, 1995*a*,*b*, 1996)

FAMILY/SPECIES	SOUTH AFRICA[a]	MOZAMBIQUE[a]	OTHER NOTES[b]
Scleractinia			
Astrocoeniidae			
Stylocoeniella guentheri Basset-Smith	—	X	
Pocilloporidae			
Seriatopora hystrix Dana	—	X	
Seriatopora caliendrum Ehrenberg	—	X	
Stylophora pistillata Esper	X	X	
Pocillopora damicornis Linnaeus	—	X	
Pocillopora verrucosa Ellis & Solander	X	X	
Pocillopora eydouxi Edwards & Haime	X	X	
Acroporidae			
Montipora venosa (Ehrenberg)	X	X	
Montipora spongodes Bernard	X	X	
Montipora aequituberculata Bernard	X	X	Mozambique: Boshoff 1981, Sheppard 1987
Montipora tuberculosa (Lamarck)	X	X	
Montipora monasteriata (Forskål)	X	X	
Montipora verrucosa (Lamarck)	X	X	
Montipora danae Edwards & Haime	X	X	
Montipora foliosa (Pallas)			Mozambique: Wijsman-Best et al. 1980
Montipora spumosa (Lamarck)			Mozambique: Wijsman-Best et al. 1980
Montipora flabellata Studer			Mozambique: Boshoff 1981, Sheppard 1987
Montipora foveolata Bernard			Mozambique: Boshoff 1981, Sheppard 1987
Montipora hispida (Dana)			Mozambique: Boshoff 1981, Sheppard 1987
Montipora paupera Marenzeller			Mozambique: Boshoff 1981, Sheppard 1987
Montipora effusa Dana			Mozambique: Boshoff 1981, Veron 1993
Montipora friabilis Bernard			Mozambique: Boshoff 1981, Veron 1993
Acropora palifera (Lamarck)	X	X	
Acropora humilis (Dana)	X	X	
Acropora digitifera (Dana)	—	X	
Acropora gemmifera (Brook)	—	X	
Acropora monticulosa (Brüggemann)	—	X	
Acropora clathrata (Brook)	X	X	
Acropora nasuta (Dana)	X	X	
Acropora valida (Dana)	—	X	
Acropora secale (Studer)	—	X	
Acropora tenuis (Dana)	X	X	
Acropora cf. *striata* Verrill	—	X	
Acropora millepora (Ehrenberg)	X	X	
Acropora formosa (Dana)	—	X	
Acropora microphthalma (Verrill)	—	X	
Acropora horrida (Dana)	X	X	
Acropora austera (Dana)	X	X	
Acropora aculeus (Dana)	X	X	
Acropora latistella (Brook)	X	X	
Acropora nana (Studer)	—	X	
Acropora danai (Edwards & Haime)	X	X	

TABLE 1 (continued)

CHECKLIST OF CORAL SPECIES RECORDED FROM SOUTH AFRICA AND MOZAMBIQUE FROM RIEGL (1993, 1995*a*,*b*, 1996)

FAMILY/SPECIES	SOUTH AFRICA[a]	MOZAMBIQUE[a]	OTHER NOTES[b]
Acropora decipiens (Brook) = *robusta* (Dana)			Mozambique: Wijsman-Best et al. 1980
Acropora polymorpha (Brook)			Mozambique: Wijsman-Best et al. 1980
Acropora anthocercis (Brook)	X	X	
Acropora hyacinthus (Dana)	X	X	
Acropora cytherea (Dana)	—	X	
Acropora florida (Dana)	X	X	
Acropora natalensis Riegl	X	X	
Acropora sordiensis Riegl	X	X	
Acropora mossambica Riegl	X	X	
Acropora branchi Riegl	X	X	
Astreopora myriophthalma (Lamarck)	X	X	
Astreopora listeri Bernard			Mozambique: Wijsman-Best et al. 1980
Poritidae			
Porites lichen Dana			
Porites solida (Forskål)	X	X	
Porites lutea Edwards & Haime	X	X	
Porites nigrescens Dana	X	X	
Porites cylindrica Dana	X	X	
Porites lobata Dana	X	X	
Porites compressa Dana	—	X	
Goniopora djiboutensis Vaughan	—	X	
Goniopora somaliensis Vaughan	X	X	
Goniopora crassa Crossland	X	X	
Goniopora stokesi Edwards & Haime	X	X	
Goniopora lobata Edwards & Haime	—	X	
Alveopora allingi Hoffmeister	—	X	
Alveopora spongiosa Dana	X	X	
Alveopora daedalea (Forskål)	X	X	Mozambique: Boshoff 1981, Sheppard 1987
Siderastreidae			
Psammocora haimeana Edwards & Haime	X	X	
Psammocora profundacella Gardiner			South Africa: Veron 1993
Psammocora contigua Esper			Mozambique: Wijsman-Best et al. 1980
Psammocora explanulata van der Horst			Mozambique: Veron 1993
Anomastrea irregularis Marenzeller			
Coscinarea monile (Forskål)	X	X	
Coscinarea columna (Dana)	X	X	
Horastrea indica Pichon	X	X	
Agariciidae			
Pavona clavus (Dana)	X	X	
Pavona decussata (Dana)	—	X	
Pavona minuta Wells	X	X	
Pavona explanulata (Lamarck)			Mozambique: Wijsman-Best et al. 1980
Pavona divaricata Lamarck			Mozambique: Wijsman-Best et al. 1980
Pavona varians Verrill			Mozambique: Wijsman-Best et al. 1980
Pavona praetorta Dana			Mozambique: Wijsman-Best et al. 1980
Pavona cactus (Forskål)	—	X	
Leptoseris explanata Yabe & Sugiyama	X	X	

TABLE 1 (continued)

CHECKLIST OF CORAL SPECIES RECORDED FROM SOUTH AFRICA AND MOZAMBIQUE FROM RIEGL (1993, 1995*a*,*b*, 1996)

FAMILY/SPECIES	SOUTH AFRICA[a]	MOZAMBIQUE[a]	OTHER NOTES[b]
Leptoseris mycetoseroides Wells			Mozambique: Wijsman-Best et al. 1980
Leptoseris incrustans (Quelch)			Mozambique: Veron 1993
Gardineroseris planulata (Dana)	X	X	
Coeloseris meyeri Vaughan	X	X	
Pachyseris speciosa (Dana)	X	X	
Fungiidae			
Cycloseris costulata Ortmann	X	X	
Cycloseris cyclolites (Lamarck)	X	X	
Cycloseris marginata (Boschma)	X	X	
Diaseris distorta (Michelin)	X	—	
Diaseris fragilis Alcock			Mozambique: Veron 1993
Fungia (Pleuractis) scutaria Lamarck	—	X	
Fungia (Verillofungia) concinna Verrill	—	X	
Fungia (Danafungia) scruposa Klunzinger	—	X	
Herpolitha limax (Hottuyn)	—	X	
Polyphyllia talpina (Lamarck)	—	X	
Podabacia crustacea (Pallas)	X	X	
Oculinidae			
Galaxea fascicularis (Linnaeus)	X	X	
Galaxea astreata (Lamarck)	—	X	
Pectiniidae			
Echinophyllia aspera (Ellis & Solander)	X	X	
Oxypora lacera (Verrill)	—	X	
Mussidae			
Blastomussa merleti (Wells)	X	—	
Acanthastrea echinata (Dana)	X	X	
Acanthastrea simplex (Crossland)	X	X	= *Acanthastrea hillae* of Wijsman-Best et al. 1980 and Veron 1993
Symphyllia valenciennesi Edwards & Haime	X	—	
Lobophyllia corymbosa (Forskål)	—	X	
Lobophyllia hemprichi (Ehrenberg)	—	X	
Scolymia cf. *vitiensis* Brüggemann	X	—	
Merulinidae			
Hydnophora exesa (Pallas)	X	X	
Hydnophora microconos (Lamarck)	X	X	
Merulina ampliata (Ellis & Solander)	—	X	
Faviidae			
Favia favus (Forskål)	X	X	
Favia pallida (Dana)	X	X	
Favia speciosa (Dana)	X	X	
Favia matthai Vaughan	X	X	
Favia rotumana (Gardiner)	X	X	
Favia stelligera (Dana)	X	X	
Barabattoia amicorum (Edwards & Haime)	—	X	
Favites abdita Ellis & Solander	X	X	
Favites chinensis (Verrill)			South Africa, Mozambique: Wijsman-Best et al. 1980
Favites complanata (Ehrenberg)	X	X	
Favites peresi Faure & Pichon	X	X	
Favites flexuosa (Dana)	X	X	
Favites halicora (Ehrenberg)	X	X	
Favites pentagona (Esper)	X	X	

TABLE 1 (continued)

CHECKLIST OF CORAL SPECIES RECORDED FROM SOUTH AFRICA AND MOZAMBIQUE FROM RIEGL (1993, 1995*a*,*b*, 1996)

FAMILY/SPECIES	SOUTH AFRICA[a]	MOZAMBIQUE[a]	OTHER NOTES[b]
Goniastrea pectinata (Ehrenberg)	X	X	
Goniastrea retiformis (Lamarck)	X	X	
Goniastrea edwardsi Chevalier	X	X	
Goniastrea australiensis (Edwards & Haime)			Mozambique: Wijsman-Best et al. 1980
Platygyra daedalea (Ellis & Solander)	X	X	
Platygyra lamellina (Ehrenberg)			Mozambique: Wijsman-Best et al. 1980
Leptoria phrygia Ellis & Solander	—	X	
Oulophyllia cripsa (Lamarck)	X	X	
Leptastrea purpurea (Dana)	X	X	
Leptastrea bottae (Edwards & Haime)	—	X	
Leptastrea cf. *bewickensis* Veron, Pichon & Wijsman-Best	X	X	
Cyphastrea chalcidicum (Forskål)	X	X	
Cyphastrea serailia (Forskål)	—	X	
Echinopora gemmacea (Lamarck)	X	X	
Echinopora lamellosa (Esper)	—	X	
Echinopora hirsutissima Edwards & Haime	X	X	
Montastrea curta (Dana)	—	X	
Plesiastrea versipora (Lamarck)	X	X	
Caryophylliidae			
Gyrosmilia interrupta Ehrenberg	X	X	
Dendrophylliidae			
Turbinaria mesenterina (Lamarck)	X	X	
Turbinaria cf. *stellulata* (Lamarck)	X	X	
Turbinaria cf. *peltata* (Esper)	X	X	
Turbinaria irregularis Bernard			Mozambique: Veron 1993
Tubastraea micranthus Ehrenberg	X	X	
Octocorallia			
Stolonifera			
Tubipora musica Linnaeus	X	X	
Hydrozoa			
Milleporina			
Millepora exaesa (Forskål)	X	X	

[a] X, species found in this study; —, species absent in this study.

[b] Includes additional records from the literature. All records in Boshoff (1981) that are not included here are erroneous and based on misidentifications. Records in Sheppard (1987) and Veron (1993) are partly based on Boshoff (1981), and only those that were not proven wrong are included here.

are apparent at the edges of the East African coral reef belt. The southeastern African coral fauna is possibly recruited by larvae transported south along the African coast. Although numerous large rivers (Zambezi, Limpopo) enter the sea and the coastline is sandy over wide areas without suitable substrate for corals, the southern Mozambican fauna is almost as rich as that of tropical East Africa. Only between southern Mozambique and northern Natal is there a decline in species richness. The situation is mirrored in the north by a drop in species richness between Kenyan and Somali reefs (Carbone et al. 1994, Lemmens 1993).

The decline in species richness between Mozambique and Natal may be due to the geomorphological and oceanographic setting of the South African reefs. These are fossil dunes and beachrock platforms (Ramsey and Mason 1990, Riegl et al. 1995) that do not reach the surface and therefore do not form

TABLE 2

SUMMARY OF POSSIBLE NUMBERS OF CORAL SPECIES IN SOUTH AFRICA AND MOZAMBIQUE

LOCALITY	NOTES	NO. OF SPECIES
South Africa	Species not reported by Wijsman-Best et al. (1980)	89
	Species not reported by Sheppard (1987)	95
	Species not reported by Veron (1993)	95
	Species accepted into this list from Wijsman-Best et al. (1980), Sheppard (1987), and Veron (1993)	2
	Total in South Africa: this study	95
	Total in South Africa: all studies	97
Mozambique	Species not reported by Wijsman-Best et al. (1980)	78
	Species not reported by Sheppard (1987)	46
	Species not reported by Veron (1993)	116
	Species accepted into this list from Wijsman-Best et al. (1980)	14
	Species accepted into this list from Sheppard (1987)	6
	Species accepted into this list from Veron (1993)	6
	Total species accepted into this list from the literature	25
	Correct taxa used by Boshoff (1981)	46
	Incorrect taxa used by Boshoff (1981)	92
	Species occurring only in South Africa and Mozambique (synendemics)	6
	Total in Mozambique: this study	126
	Total in Mozambique: all studies	151

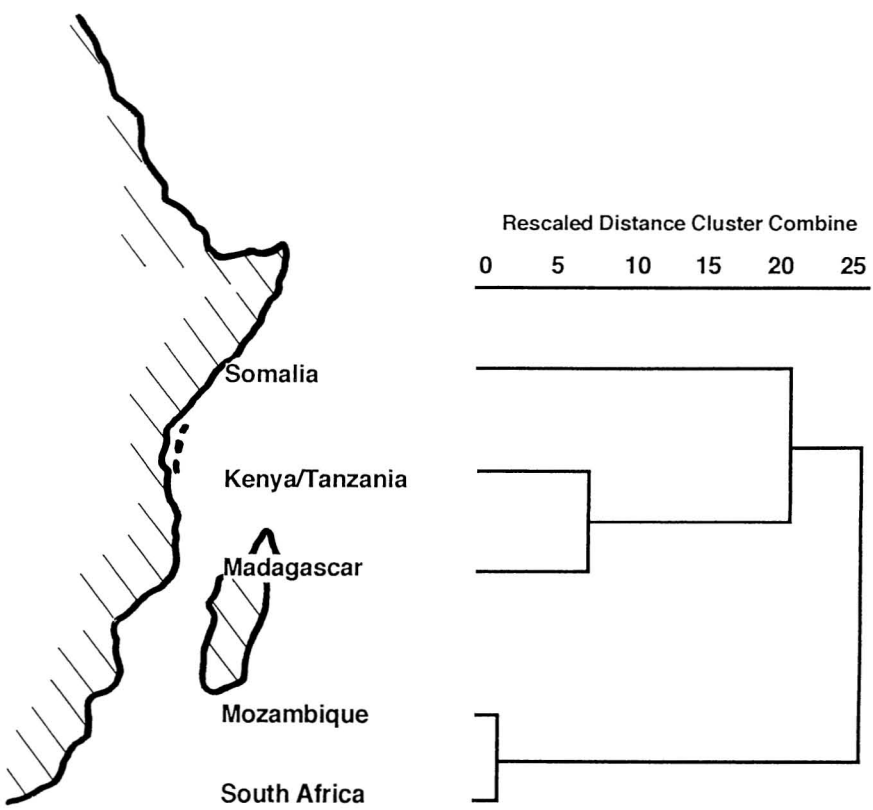

FIGURE 2. Classification of eastern African and Madagascan coral faunas.

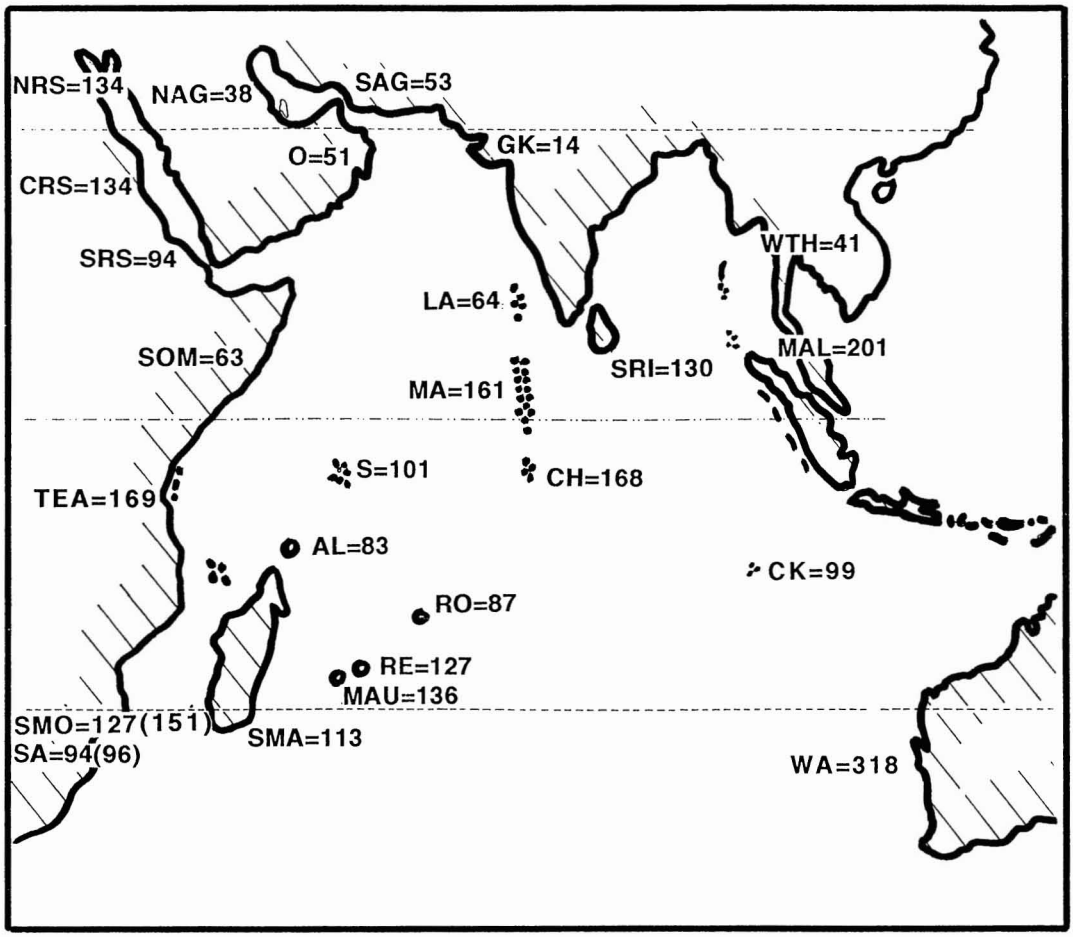

FIGURE 3. Distribution of hermatypic coral species richness in the Indian Ocean. Data are from Sheppard (1987), except for Cocos-Keeling (Veron 1990), Western Australia (Veron and Marsh 1988), South Africa and Mozambique (this study), Kenya (Lemmens 1993) and Somalia (Carbone et al. 1994). AL, Aldabra; CH, Chagos; CRS, central Red Sea; GK, Gulf of Kutch; CK, Cocos (Keeling); LA, Lakkadives; MA, Maldives; MAL, Malakka Peninsula; MAU, Mauritius; NAG, northern Arabian Gulf; NRS, northern Red Sea; RE, Réunion; RO, Rodrigues; S, Seychelles; SA, South Africa (number in parentheses based on records from this study plus records from literature); SAG, southern Arabian Gulf; SMA, southern Madagascar; SMO, southern Mozambique (number in parentheses based on records from this study plus records from literature); SOM, Somalia; SRI, Sri Lanka; SRS, southern Red Sea; TEA, tropical East Africa; WA, Western Australia; WTH, western Thailand.

reef flats, typical reef slopes, or lagoonal environments. Some typical shallow reef species (*Acropora gemmifera* [Brook], *A. monticulosa* [Brüggemann]) and lagoonal species (*A. formosa* [Dana], *A. microphthalma* [Verrill]) are therefore missing in South Africa. Particularly the Acroporidae and Fungiidae are better represented in Mozambique than in South Africa (Acroporidae: 34 versus 26 species; Fungiidae: 9 versus 5 species, respectively).

The East African coral fauna is poorer than that of the eastern fringe of the Indian Ocean (Figure 3), reflecting its distance from the center of Indo-Pacific diversity in the Indo-Malaysian archipelago (Veron 1994). The number of species from Mozambique

(151), the second-richest coral fauna so far recorded on the western fringe of the Indian Ocean, is similar to the numbers known from high-latitude reefs on the western fringe of the Pacific (151 species from Tanegashima, southern Japan; 163 species from the Pompey and Swain reefs of the southern Great Barrier Reef [Veron 1993]), but far more than the numbers recorded from the Hawaiian archipelago (depending on locality, between 12 and 22 species [Grigg 1983]) at the eastern edge of Indo-Pacific coral distribution. Species attenuation on the southwestern Indian Ocean fringe is more abrupt than on the southwestern Pacific fringe. A gradual drop from 151 to 96 species is observed between Mozambique and South Africa (the distance from Inhaca Island to Maputaland reefs is about 150 km), but species richness drops abruptly in South Africa, from 96 in Maputaland to about 10 on Aliwal Shoal, roughly 300 km farther south. Species attenuation in the western Pacific in Japan and eastern Australia is more gradual (Veron 1993). In South Africa, the southwestern extreme of coral reef distribution in the Indo-Pacific, still roughly one-fourth of the highest species richness (411 species in the Philippines [Veron 1993]) is observed, but in Hawai'i, the opposite extreme, only 3–5% of this species richness is still present (Grigg 1983). There are also strong ties with the Pacific Ocean. *Favia speciosa* (Dana), for example, common in South Africa, is also common on southerly reefs in Australia (Veron and Pichon 1982). The preponderance of *Porites* species, as in Hawai'i and the eastern Pacific (Grigg 1983), is not observed in southeastern Africa.

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